SECTION 7

PROJECT NARRATIVE

7.1 Discuss in narrative form the following issues as they pertain to the project:

- anticipated use(s) of the data
- how the success and/or failure of the project will be determined
- survey design requirements and description
- sample type and sampling location requirements
- sample handling and custody requirements
- selection of analytical methods
- calibration and replicate samples
- SOPs for field sampling activities
- plans for peer reviews prior to data collection, and
- any ongoing assessments during actual operations (oversight).

The narrative should allow technical or QA readers to relate the project to the DQOs and to the problem definition. Since this element addresses many other QAPP elements in narrative form, it is not necessary to repeat information for those categories that are covered in more detail elsewhere. For example, SOPs for field sampling are discussed in detail in section 10 of a QAPP and therefore would not have to be repeated in great detail in this section.

SECTION 8

SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

8.1 Specialized training or certification requirements needed for personnel to successfully complete the project should be identified and described. Describe how the training will be provided and how the required skills will be assured and documented.

8.2 STAFF TRAINING

8.2.1 All personnel conducting assessments must be trained in a consistent manner, preferably by the same person(s), to maximize the likelihood of standardization and properly conducted assessments. If possible, sampling crews should be trained by the most experienced individual; this individual would be considered "certified" to train and may verify others to train upon sufficient demonstration of knowledge and consistency of techniques. The certified trainer is considered part of the QA program and should conduct revisits of sampling sites to determine bias. Crews could revisit some of their own assessment sites to determine among-crew precision. Precision of multiple sampling teams can be determined after adequate evaluation of among-crew precision.

8.2.2 The designated QAO is responsible for confirming consistency among investigators. At regularly scheduled intervals, a different field group should visit selected overlap sites and perform assessment techniques to use as a replicate of a previous assessment. Results from two separate assessments conducted by two different teams can determine if reproducible results are being attained. This is an ongoing process that should, over time, allow for consistent investigations of all sampling teams. Quality control of picking, sorting, and taxonomic identifications can also be evaluated in this way.

8.2.3 Training is not only for the inexperienced, but also is used to maintain consistency among <u>all</u> crews. Training should be conducted at regularly scheduled intervals and should occur in all aspects of a program. This can be accomplished through workshops, seminars, or field demonstrations. Management should periodically assess the training needs of all personnel engaged in fieldwork and recommend and support their participation in appropriate and relevant seminars, training courses, and professional meetings. Biologists and technicians should be expected to participate regularly in evaluation and/or certification programs where appropriate. These programs should be included as current resumes which are on file for each person responsible for the sampling, analysis, evaluation, and reporting of biological data.

surface of several rocks selected at random; lifting microalgae from mud or silt substrates with an eyedropper; hand picking macroalgae in proportion to their abundance; and removing epiphitic algae from macroalgae by shaking in a separate container (Bahls 1992). The goal of this SOP is to obtain a single composite sample that is a miniature replica of the algae present at the site. The algae is then placed in a water tight, non-breakable sample container (125ml capacity) and preserved with enough ambient water to cover the sample and iodine potassium iodide (Lugol's solution) to a reddish-brown tint. Any onsite modifications should be made by the crew leader or the approval (phone) of the Principle Investigator with documentation of the rationale used for the modification along with the appropriate methods validation information. The sample should be kept dark and cold until processing (refrigeration is not needed for transport). Samples stored at room temperature in daylight should have the Lugol's solution replenished every few weeks. Any further specific requirements for assemblage collections would also be included in this section.

10.3 STANDARD OPERATING PROCEDURES (SOPs)

10.3.1 SOPs are written procedures that detail the precise methods to be used during each step of the sample collection, handling, transportation, and holding time process. When existing written procedures are applicable and available, they may be incorporated into the QAPP by reference. The SOPs should provide an outline of the steps to be taken to assure the quality of the samples and sample data. A complete set of SOPs should be approved by the Project Manager and bound together in a looseleaf notebook that is easily accessible to personnel for referral (ASTM 1991). Any deviations from the SOPs should be documented with the reason for the deviation and any possible effect the deviation might have on the resulting data. Modifications made to SOPs due to addition of new information or correction of errors need approval by the Project Manager. SOPs should contain document headers (as described in section 1) in order to track the latest revisions; old versions should be discarded.

10.3.2 QAPPs should provide for the review of all activities which could directly or indirectly influence sample quality and the determination of those operations which must be covered by SOPs. The SOPs should describe the following:

- method summary/rationale
- selection of target assemblage(s)
- sampling methodology, including decontamination procedures
- physical and biological habitat assessment methodology
- equipment/materials
- reagents
- details of preservation, holding times, and transport
- use and calibration of instruments

- replication and QC requirements
- safety
- sampling site selection (including reference sites)
- sample labeling
- sample subsampling
- data reduction formulas.

10.4 GUIDELINES USED TO SELECT SAMPLING SITES

10.4.1 Proper selection of sampling sites should be directed toward maximizing accuracy, minimizing uncertainty or, at least, providing a means by which variability may be reduced. This is related to the concept of only comparing community-level data (between reference and test sites) if similar habitat exists. Ideally, site selection criteria would be concise so that if two researchers were to follow them, each would choose similar locations. The criteria should minimize the amount of subjectivity that enters into the site selection process. For example, the two primary criteria used in selecting reference sites for stream bioassessment are minimal impairment and representativeness (Gibson 1994). The conditions at reference sites should represent the best range of minimally-impaired conditions that can be achieved by similar streams within a particular ecological region (Hughes et al. 1995) (Section 6.4).

10.4.2 A probabilistic site selection process is one whereby sampling sites are selected at random to ensure representativeness. Random selection provides a statistically-valid estimate of the condition of a waterbody class or other habitat class (e.g., lakes, large rivers, streams). These gross-level classes can be further stratified into finer divisions based on geographic or other ecological, physical, and chemical factors, and are used to group sites that share them. Probabilistic site selection is the foundation of the regional monitoring approach of USEPA/Environmental Monitoring and Assessment Program (EMAP).

For point source assessments, the sampling site selection should include stations upstream and downstream of the source, as well as at least three regional reference stations. For instance, the selection of sampling sites should be conducted in such a way as to reduce variability and uncertainty by ensuring that the physical characteristics between sampling sites are similar. If surveys are conducted to determine use designations, sampling locations should be representative of the stream reach. Reference conditions should include minimally impaired sites in the same ecoregion, size class, and stream type (width, depth, gradient). The objectives of the study will determine the selection of specific sampling habitat and the gear best suited for the physical habitat sampled within a sampling reach.

10.5 HABITAT CHARACTERIZATION

10.5.1 An evaluation of physical and biological habitat quality is critical to any assessment of ecological integrity (Karr et al. 1986; Barbour and Stribling 1991; Plafkin et al. 1989; Kaufmann 1993). Habitat assessment supports understanding of the relationship between physical habitat quality and biological conditions and should consist of parameters appropriate for the assemblage being sampled since habitat features important for one assemblage may be different than those for another. Such assessment identifies obvious constraints on the attainable potential of the site, assists in the selection of appropriate sampling stations, and provides basic information for interpreting biosurvey results. Different habitats or habitat types often become strata in the design.

10.5.2 QA methods for physical and biological habitat assessment should be documented. Standardized field data sheets should be employed as should multiple observers at some percentage of the study sites which range from physically impaired to unimpaired.

10.5.3 Each investigator involved in the physical and biological habitat characterization must be appropriately trained to minimize variability in the final conclusions.

10.6 SAMPLING PERIOD

10.6.1 Sample timing should be consistent to reduce variability within or among datasets. A critical value to assess when considering data variability is the most appropriate period for sample collection, which can vary with the target assemblage; both season and time of day should be considered. Pilot studies should be conducted to determine an index period with the least sampling variability. The sampling period, like the sampling area, defines the domain of study and should be documented. By considering the following issues, some QA concerns can be addressed:

- Seasonal Influence - Time of year should be considered to determine its influence on the objectives of the project. For example, food availability, flow, and temperature are important seasonal factors that influence condition of the biota. This determination can be accomplished through literature searches on similar ecosystem monitoring studies as well as through reconnaissance and pilot studies.

- Community Succession and Life Stages - A familiarity of life cycles may be critical in monitoring some community assemblages.

- Habitat/substrate disturbance (e.g., elapsed time since last storm event, etc.).

As general guidance, sampling periods should be selected in order to:

- maximize the efficiency of the chosen sampling gear;
- maximize the accessibility of the targeted assemblage or species;
- minimize natural variability;
- maximize the availability of technical personnel.

Sampling periods should also be selected so that extremes in climatic conditions are avoided (e.g., water temperature and flow [drought, rainy season, snowmelt]) unless the object of the study is to investigate the limiting affects of seasonal variations on the biota, or system complexity and recovery following storm events (which could be hazardous to the sampling crew). Sampling conducted during periods of stress should be well documented since natural stressors (i.e., high and low flow, temperature, etc.) can mask or accentuate impacts.

10.7 DOCUMENTATION

10.7.1 The field data sheets should be filled out completely and accurately to provide a record in support of the survey and analysis conclusions. Abbreviations commonly used in documentation (e.g., scientific names) should be standardized and defined to decrease data manipulation errors. Portable data recorders (PDR) may be used to increase the completeness and accuracy of field data and computer entry time.

10.7.2 Each sample collected should also be documented by assigning a unique identification number, log number, and internal and external labels. An example of the sample labelling information can be found in Figure 10-1; sample numbering examples are presented in Figure 10-2. Data should be documented to allow

Agency/Client_____

Project No._____ Sample No._____

Location/Waterbody_____ Station_____

Assemblage_____ Habitat_____

Method (Gear)_____ Preservative_____

Collected by_____ QC Sample_____

Date_____ Time_____ Log #_____

FIGURE 10-1 Example of sample label information.

1) A13 / 91 / 006

corresponds to:

Alex Branch, Station 13 / Year / Serial log number of project

2) 6874-01 / A13 / 006

corresponds to:

Project number / Alex Branch, Station 13 / Serial log number of project

FIGURE 10-2 Alternative examples of sample identification numbering. Example 1 relates the sample to the year; example 2 relates the sample to a contract or project number.

complete reconstruction from initial field record through data storage system retrieval.

10.7.3 The Field/Sampling Leader and Laboratory Leader personnel should keep complete and permanent records of all conditions and activities that apply to each individually-numbered sample. All field and laboratory data sheets should be dated and signed by the individual doing the sampling and the analyst, respectively; taxonomic reference documents should be approved and noted. Notebooks, data sheets, and all other records that may be needed to document the integrity of the data should be archived at study completion and kept permanently filed in a safe and fireproof location. Records and voucher samples should be maintained at least 3 years or other specified time as stated in the workplan and/or contract. Archived records are the responsibility of the study sponsor, unless the responsibility is delegated.

10.8 REPLICATION

10.8.1 Field sampling validation involves two procedures:

1) collection of replicate samples at a randomly selected 10 percent of sampling stations to document the precision of the collection effort; and

2) for visual-based qualitative habitat structure assessments, two or more observers should independently complete field sheets for at least 10 percent of stations. The precision of this procedure can then be evaluated by relative percent difference (RPD) (Section 6.6).

The 10 percent figure should be viewed as rule-of-thumb guidance for replication. For large projects, 10 percent replication would probably be too many; similarly, for small projects, 10 percent would likely not be enough. General recommendations for different levels of replication are presented in Table 10-1.

10.9 METHOD AND GEAR SELECTION

10.9.1 Selection of sampling gear should be appropriate for the target assemblage, habitat, and analytical methods employed and depends on the DQOs of the decisionmakers, the expertise of the biologist, and the unresolvable components of variation (USEPA 1990a). Where appropriate, methods should include decontamination SOPs. For example when using a net for collection of small organisms, the nets must be thoroughly cleaned between samples so that

TABLE 10-1 Rule-of-thumb for number of replicate QC samples based on numbers of sites.

No. of sampling sites in project (n)	No. of replicates
$n \geq 150$	15
$30 \leq n \leq 150$	10%
$n \leq 30$	3
$n = 2$	3
$n = 1$	3

organisms captured at one station do not get carried over and included in the next station. In cases where it is suspected that an organism has been carried over from one station to the next, the field notes should be consulted to determine if the (outlier) organism could indeed be left over from a previous sample. If it becomes obvious that an organism was left on the gear from a previous sample, a statement should be included on the data sheet that the carry-over organism will not be included in the metric calculations. This situation is rare but when it occurs, it will most often occur with gear used in sampling small organisms.

10.9.2 The type of gear used in the sampling process depends on the assemblage and the specific habitat sampled within a site. For instance, macroinvertebrate sampling gear may include kicknets, Hess sampler, surber samplers, or other stream-net samplers (USEPA 1990a) used in riffles; dipnets are used in low gradient streams in shorezones, banks, snags, and submerged vegetation. Electrofishers, seines, and Fyke nets may be used for fish. Knives used for scraping algae from rock, spoons or large-bore eyedroppers for lifting microalgae from silt substrates, hand picking macroalgae, and dislodging epiphytic algae from macroalgae by shaking in a container are some gear types or methods used in algal collections.

10.10 LEVEL OF EFFORT (LOE)

10.10.1 The level of effort required for the completion of a specific task should be outlined before the task is undertaken. For example, for field sampling, the appropriate number of people for unbiased and consistent operation of field gear should be available (e.g., two people for collections with a net or hand collections, three to four people for electrofishers), and the appropriate amount of time per site needs to be allowed for consistent and proper application of methodologies. The amount of time necessary for effective gear operation will vary per site with the target plant or animal assemblages and the gear used. For planning purposes, Plafkin et al. (1989) provided approximate estimates for the amount of time needed for sampling protocols for use of the square meter kicknet in sampling

benthic macroinvertebrates in riffles. Approximately 1.5 person-hours are required per site (two people, approximately 40 minutes each). The 40 minutes of actual time includes writing labels, preparing sample containers, taking a double composite square meter sample, field preservation, and collection of supplemental Course Particulate Organic Material (CPOM) samples. An additional 15 to 20 minutes is required to complete the habitat assessment forms. More time is added to total station LOE for additional observers completing duplicate habitat assessments. Additionally, time must be allocated for traveling to the site.